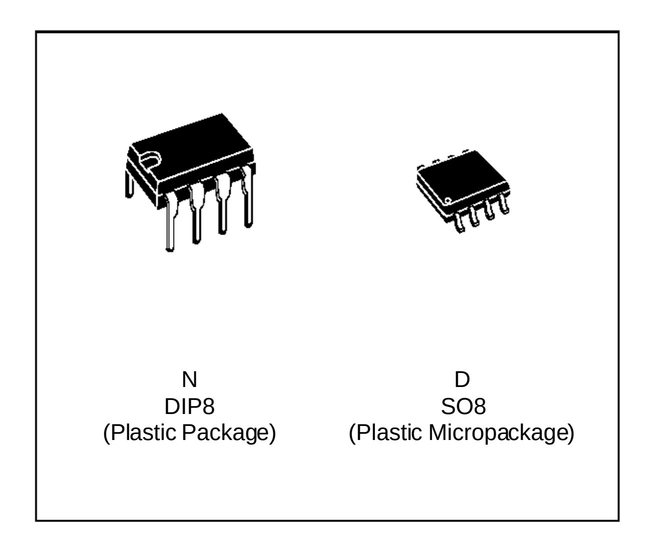


TL071
TL071A - TL071B

LOW NOISE SINGLE J-FET OPERATIONAL AMPLIFIERS

- LOW POWER CONSUMPTION
- WIDE COMMON-MODE (UP TO V_{CC}^{+}) AND DIFFERENTIAL VOLTAGE RANGE
- LOW INPUT BIAS AND OFFSET CURRENT
- LOW NOISE $e_n = 15nV/\sqrt{Hz}$ (typ)
- OUTPUT SHORT-CIRCUIT PROTECTION
- HIGH INPUT IMPEDANCE J–FET INPUT STAGE
- LOW HARMONIC DISTORTION : 0.01% (typ)
- INTERNAL FREQUENCY COMPENSATION
- LATCH UP FREE OPERATION
- HIGH SLEW RATE : 16V/µs (typ)



DESCRIPTION

The TL071, TL071A and TL071B are high speed J–FET input single operational amplifiers incorporating well matched, high voltage J–FET and bipolar transistors in a monolithic integrated circuit.

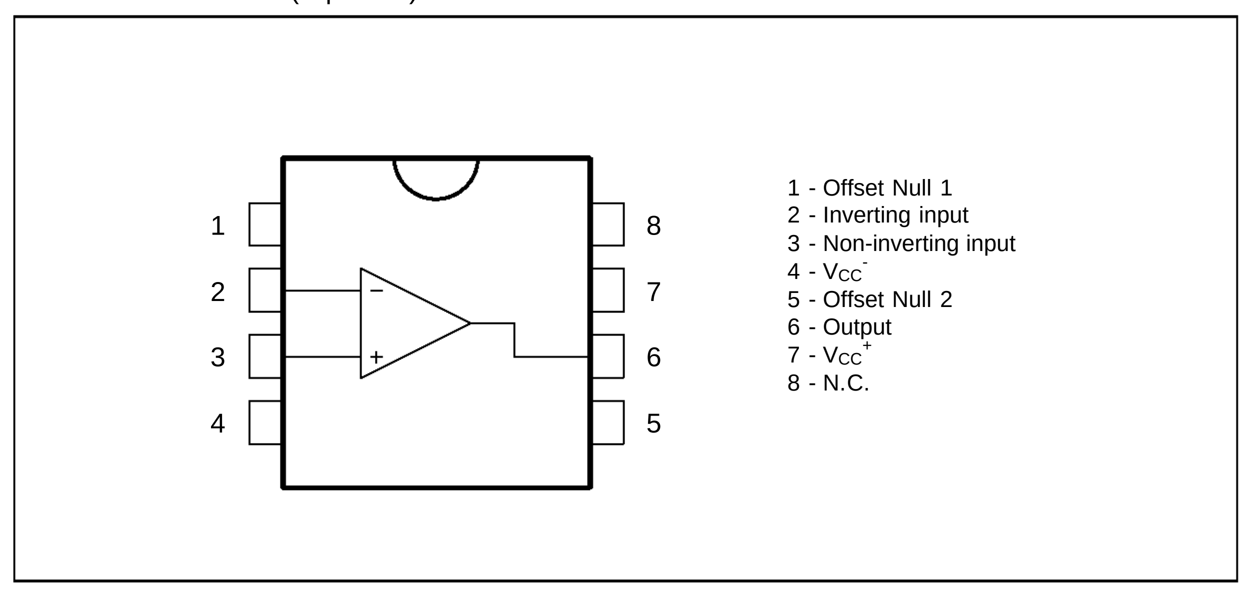
The devices feature high slew rates, low input bias and offset currents, and low offset voltage temperature coefficient.

ORDER CODES

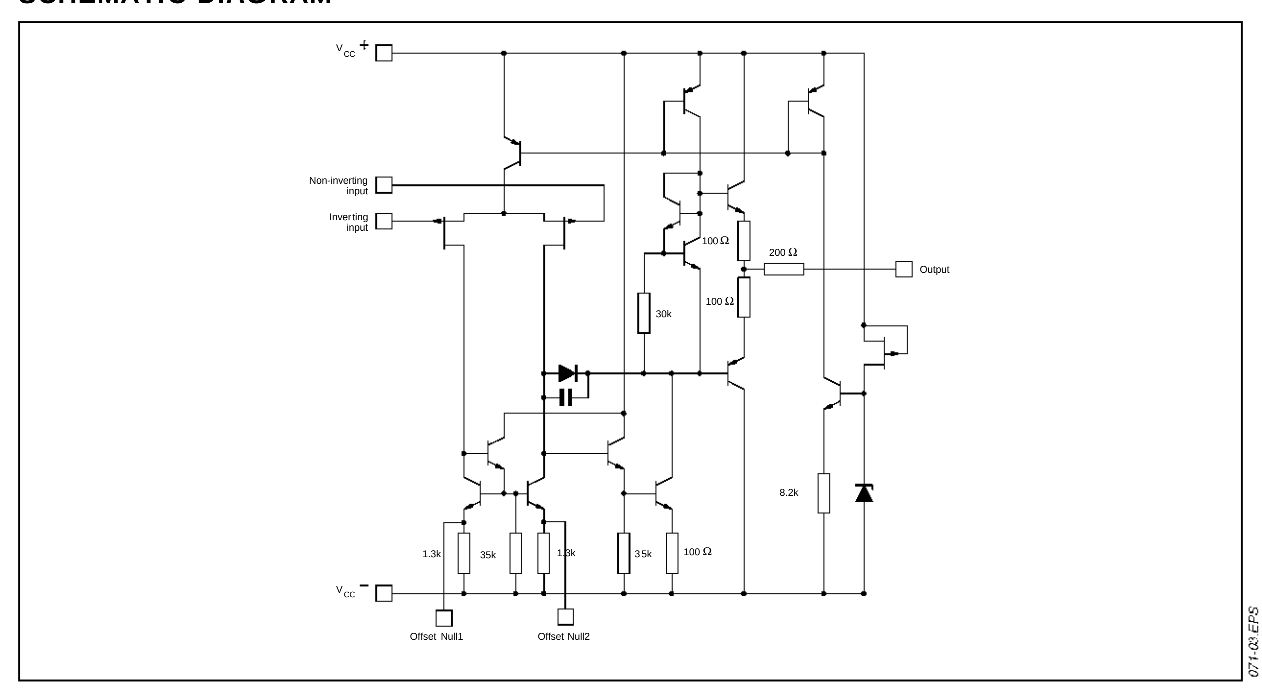
Part Number	Temperature Range	Package	
		N	D
TL071M/AM/BM	–55°C, +125°C	•	•
TL071I/AI/BI	–40°C, +105°C	•	•
TL071C/AC/BC	0°C, +70°C	•	•
Example : TL071CN			

071-01.TBL

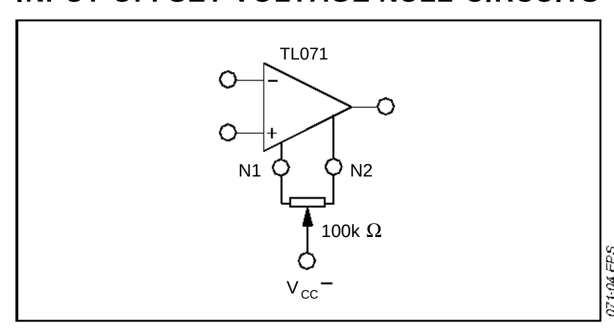
PIN CONNECTIONS (top view)



SCHEMATIC DIAGRAM



INPUT OFFSET VOLTAGE NULL CIRCUITS



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter		Value	Unit
V_{CC}	Supply Voltage - (note 1)		±18	V
V_i	Input Voltage - (note 3)		±15	V
V_{id}	Differential Input Voltage - (note 2)		±30	V
P_{tot}	Power Dissipation		680	mW
	Output Short-circuit Duration - (note 4)		Infinite	
T_{oper}	Operating Free Air Temperature Range	TL071C,AC,BC TL071I,AI,BI TL071M,AM,BM	0 to 70 –40 to 105 –55 to 125	°C
T_{stg}	Storage Temperature Range		–65 to 150	°C

071-02.TBL

Notes :
1. All voltage values, except differential voltage, are with respect to the zero reference level (ground) of the supply voltages where the zero reference level is the midpoint between V_{CC}^{+} and V_{CC}^{-}.
2. Differential voltages are at the non-inverting input terminal with respect to the inverting input terminal.
3. The magnitude of the input voltage must never exceed the magnitude of the supply voltage or 15 volts, whichever is less.
4. The output may be shorted to ground or to either supply. Temperature and /or supply voltages must be limited to ensure that the dissipation rating is not exceeded.



ELECTRICAL CHARACTERISTICS

$V_{CC} = \pm 15V$, $T_{amb} = 25^oC$ (unless otherwise specified)

Symbol	Parameter	TL071I,M,AC,AI, AM,BC,BI,BM			TL071C			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	
V_{io}	Input Offset Voltage ($R_S = 50\Omega$) $T_{amb} = 25^oC$ TL071BC,BI,BM $T_{min.} \le T_{amb} \le T_{max.}$ TL071BC,BI,BM		 3 1	 6 3 7 5		 3	 10 13	mV
DV_{io}	Input Offset Voltage Drift		10			10		$\mu V/^oC$
I_{io}	Input Offset Current * $T_{amb} = 25^oC$ $T_{min.} \le T_{amb} \le T_{max.}$		 5	 100 4		 5	 100 10	 pA nA
I_{ib}	Input Bias Current * $T_{amb} = 25^oC$ $T_{min.} \le T_{amb} \le T_{max.}$		 20	 200 20		 20	 200 20	 pA nA
A_{vd}	Large Signal Voltage Gain ($R_L = 2k\Omega$, $V_O = \pm 10V$) $T_{amb} = 25^oC$ $T_{min.} \le T_{amb} \le T_{max.}$	 50 25	 200		 25 15	 200		V/mV
SVR	Supply Voltage Rejection Ratio ($R_S = 50\Omega$) $T_{amb} = 25^oC$ $T_{min.} \le T_{amb} \le T_{max.}$	 80 80	 86		 70 70	 86		dB
I_{CC}	Supply Current, no Load $T_{amb} = 25^oC$ $T_{min.} \le T_{amb} \le T_{max.}$		 1.4	 2.5 2.5		 1.4	 2.5 2.5	mA
V_{icm}	Input Common Mode Voltage Range	± 11	+15 -12		± 11	+15 -12		V
CMR	Common Mode Rejection Ratio ($R_S = 50\Omega$) $T_{amb} = 25^oC$ $T_{min.} \le T_{amb} \le T_{max.}$	 80 80	 86		 70 70	 86		dB
Ios	Output Short-circuit Current $T_{amb} = 25^oC$ $T_{min.} \le T_{amb} \le T_{max.}$	 10 10	 40	 60 60	 10 10	 40	 60 60	mA
$\pm V_{OPP}$	Output Voltage Swing $T_{amb} = 25^oC$ $R_L = 2k\Omega$ $R_L = 10k\Omega$ $T_{min.} \le T_{amb} \le T_{max.}$ $R_L = 2k\Omega$ $R_L = 10k\Omega$	 10 12 10 12	 12 13.5		 10 12 10 12	 12 13.5		V
SR	Slew Rate ($V_{in} = 10V$, $R_L = 2k\Omega$, $C_L = 100pF$, $T_{amb} = 25^oC$, unity gain)	8	16		8	16		$V/\mu s$
t_r	Rise Time ($V_{in} = 20mV$, $R_L = 2k\Omega$, $C_L = 100pF$, $T_{amb} = 25^oC$, unity gain)		0.1			0.1		μs
K_{OV}	Overshoot ($V_{in} = 20mV$, $R_L = 2k\Omega$, $C_L = 100pF$, $T_{amb} = 25^oC$, unity gain)		10			10		%
GBP	Gain Bandwidth Product (f = 100kHz, $T_{amb} = 25^oC$, $V_{in} = 10mV$, $R_L = 2k\Omega$, $C_L = 100pF$)	2.5	4		2.5	4		MHz
R_i	Input Resistance		10^{12}			10^{12}		Ω
THD	Total Harmonic Distortion (f = 1kHz, $A_V = 20dB$, $R_L = 2k\Omega$, $C_L = 100pF$, $T_{amb} = 25^oC$, $V_O = 2V_{PP}$)		0.01			0.01		%
e_n	Equivalent Input Noise Voltage (f = 1kHz, $R_s = 100\Omega$)		15			15		$\frac{nV}{\sqrt{Hz}}$
$\varnothing m$	Phase Margin		45			45		Degrees

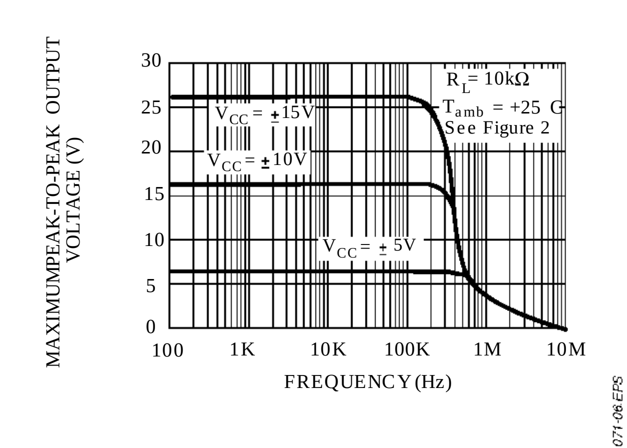
071-03.TBL

* The input bias currents are junction leakage currents which approximately double for every 10^oC increase in the junction temperature.

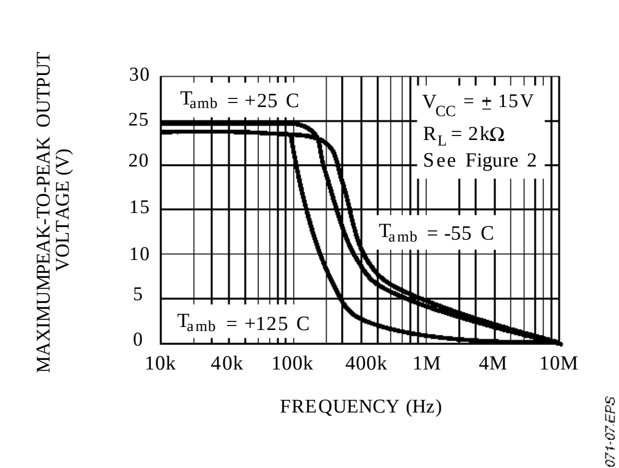
MAXIMUM PEAK-TO-PEAK OUTPUT VOLTAGE VERSUS FREQUENCY

MAXIMUM PEAK-TO-PEAKOUTPUT VOLTAGE (V)
30 25 20 15 10 5 0
V_{CC} = ± 15V
V_{CC} = ± 10V
V_{CC} = ± 5V
R_L = 2kΩ
T_{amb} = +25°C
See Figure 2
100 1K 10K 100K 1M 10M
FREQUENCY (Hz)
071-05.EPS

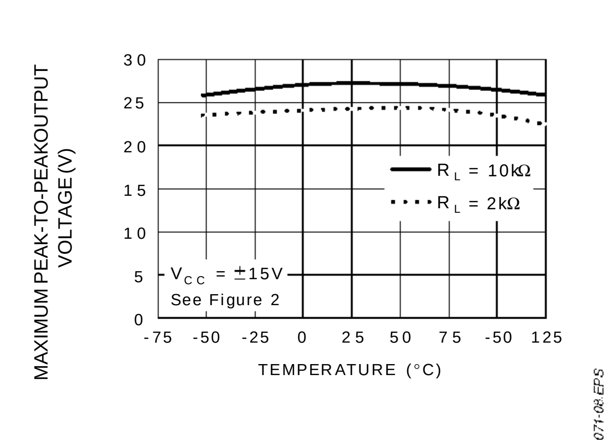
MAXIMUM PEAK-TO-PEAK OUTPUT VOLTAGE VERSUS FREQUENCY



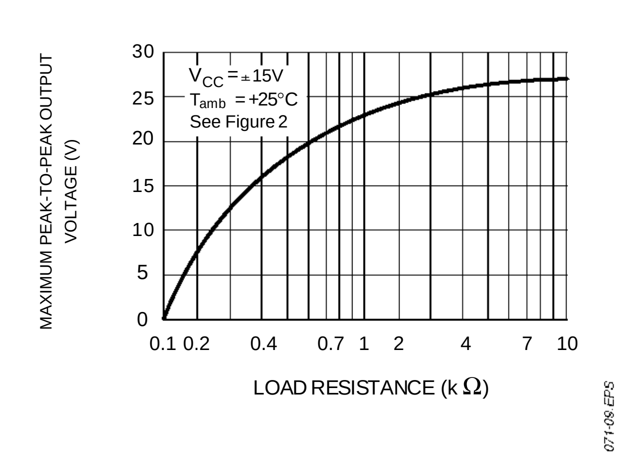
MAXIMUM PEAK-TO-PEAK OUTPUT VOLTAGE VERSUS FREQUENCY



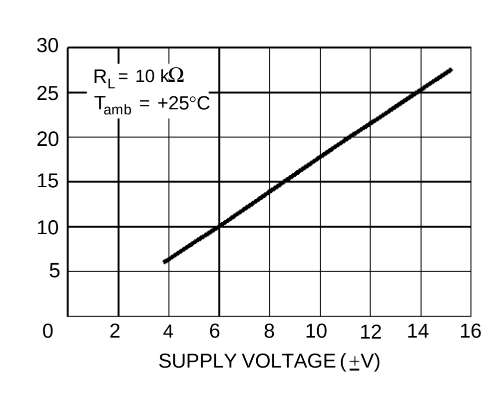
MAXIMUM PEAK-TO-PEAK OUTPUT VOLTAGE VERSUS FREE AIR TEMP.



MAXIMUM PEAK-TO-PEAK OUTPUT VOLTAGE VERSUS LOAD RESISTANCE



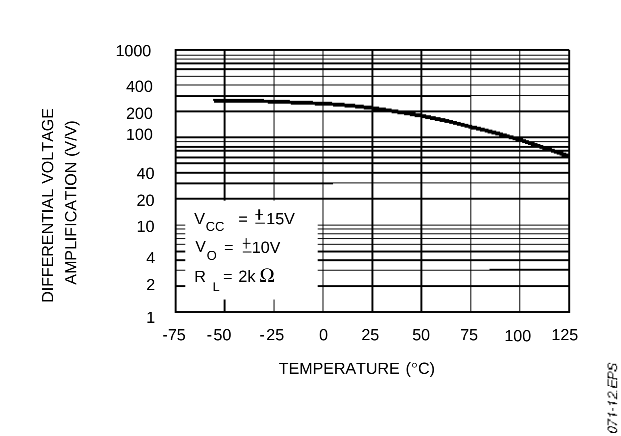
MAXIMUM PEAK-TO-PEAK OUTPUT VOLTAGE VERSUS SUPPLY VOLTAGE



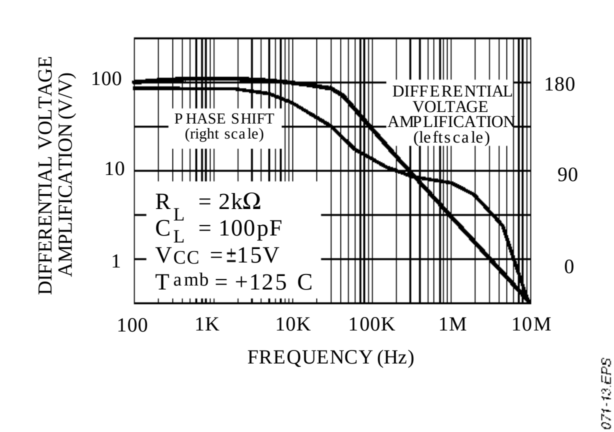
INPUT BIAS CURRENT VERSUS FREE AIR TEMPERATURE

100
10
1
0.1
0.01
V_{CC} = ± 15V
INPUT BIAS CURRENT (nA)
-50 -25 0 25 50 75 100 125
TEMPERATURE (°C)
071-11.EPS

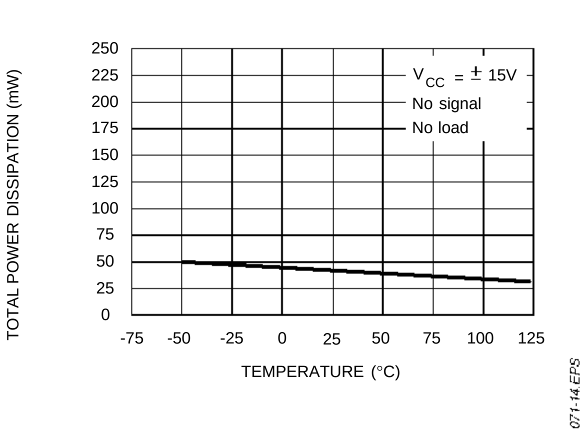
LARGE SIGNAL DIFFERENTIAL VOLTAGE AMPLIFICATION VERSUS FREE AIR TEMPERATURE



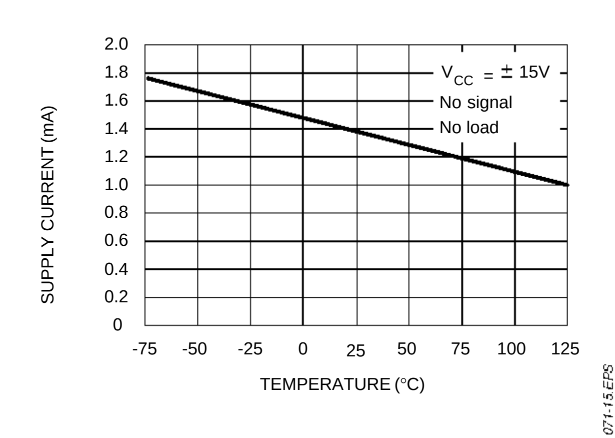
LARGE SIGNAL DIFFERENTIAL VOLTAGE AMPLIFICATION AND PHASE SHIFT VERSUS FREQUENCY



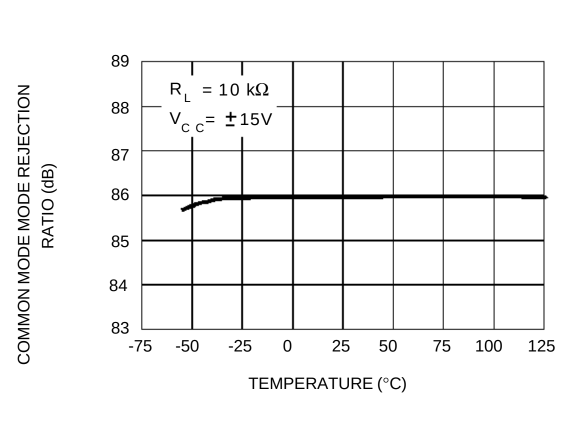
TOTAL POWER DISSIPATION VERSUS FREE AIR TEMPERATURE



SUPPLY CURRENT PER AMPLIFIER VERSUS FREE AIR TEMPERATURE



COMMON MODE REJECTION RATIO VERSUS FREE AIR TEMPERATURE



VOLTAGE FOLLOWER LARGE SIGNAL PULSE RESPONSE

INPUT AND OUTPUT VOLTAGES (V)

OUTPUT

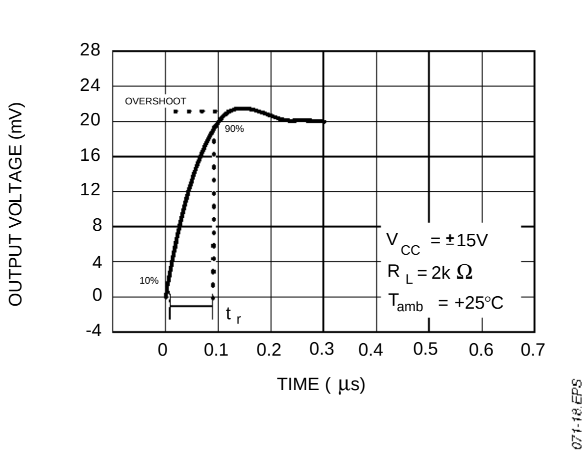
INPUT

V_{CC} = ±15V
R_L = 2 kΩ
C_L = 100pF
T_{amb} = +25 C

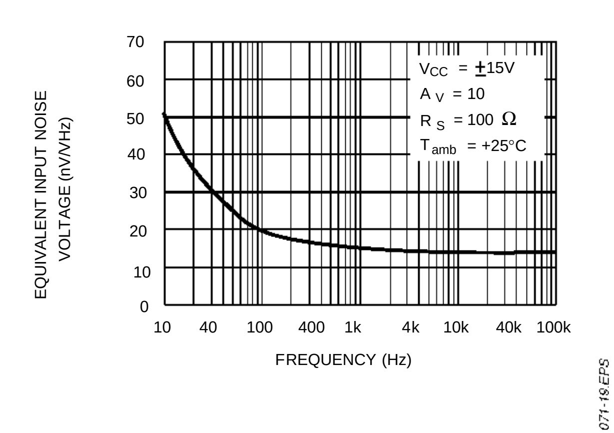
TIME (µs)

071-17.EPS

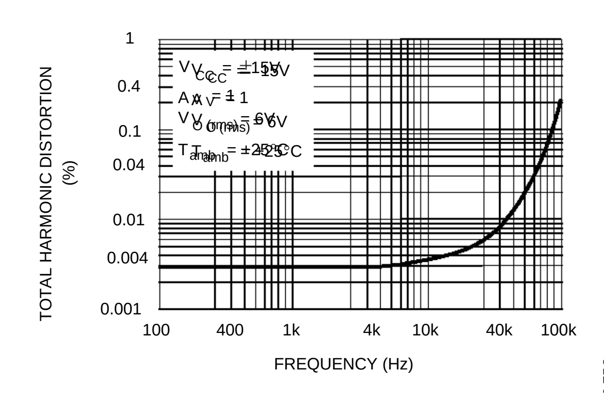
OUTPUT VOLTAGE VERSUS ELAPSED TIME



EQUIVALENT INPUT NOISE VOLTAGE VERSUS FREQUENCY



TOTAL HARMONIC DISTORTION VERSUS FREQUENCY



PARAMETER MEASUREMENT INFORMATION

Figure 1 : Voltage Follower

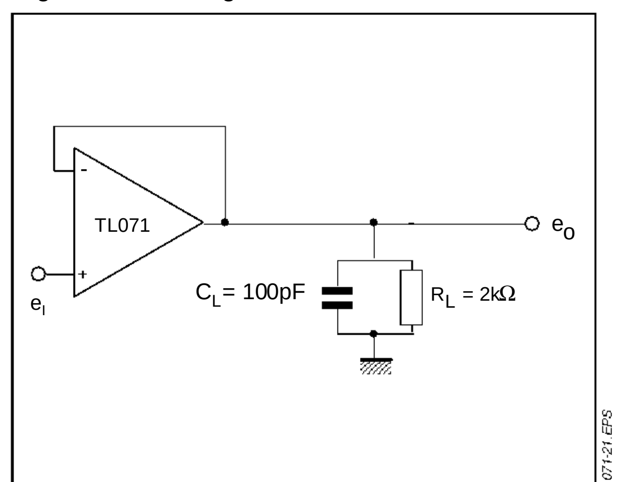
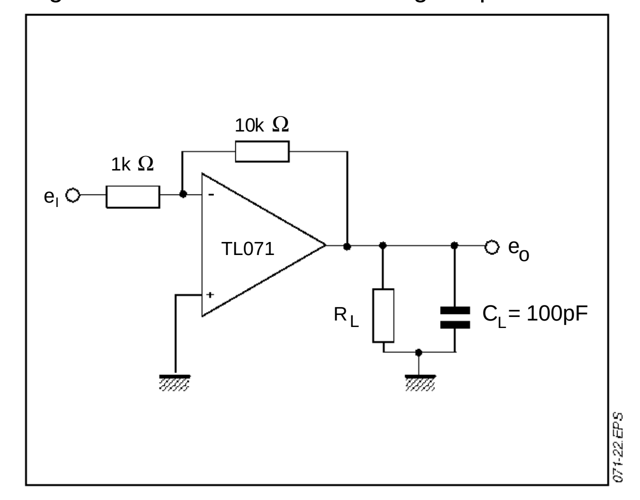
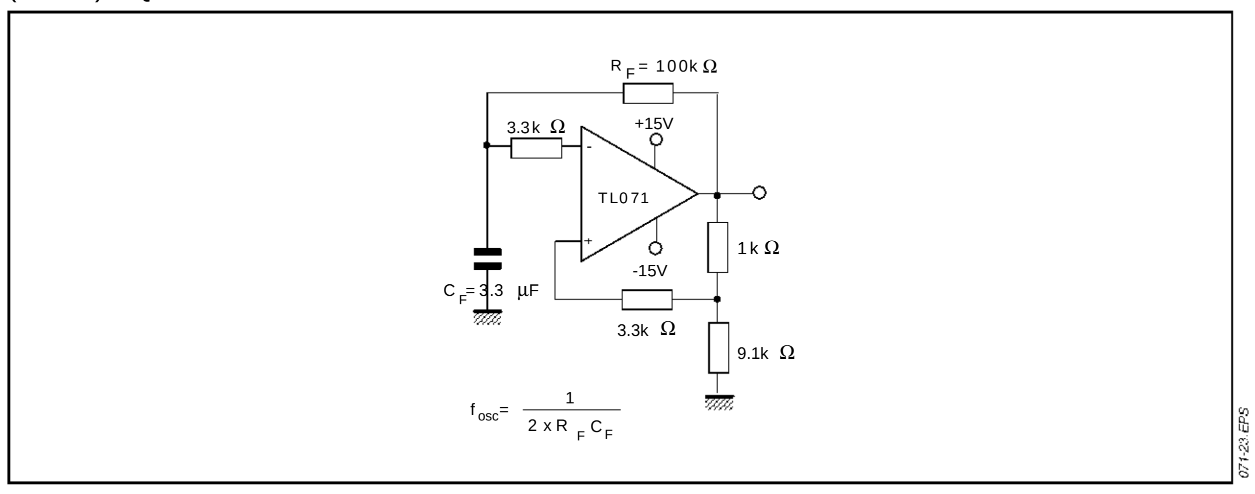


Figure 2 : Gain-of-10 Inverting Amplifier

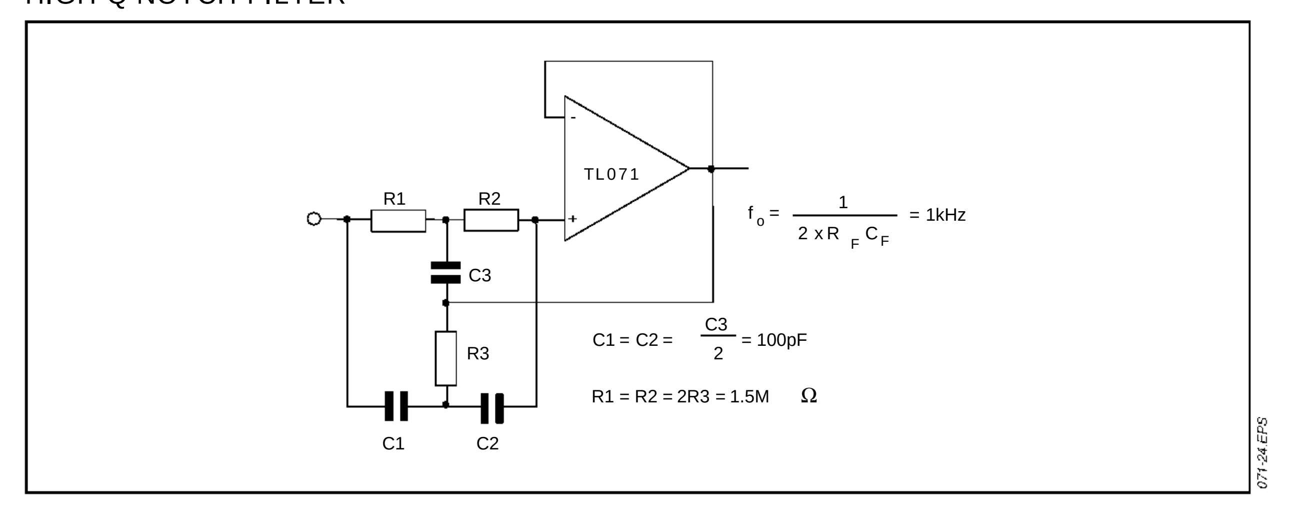


TYPICAL APPLICATIONS

(0.5Hz) SQUARE WAVE OSCILLATOR

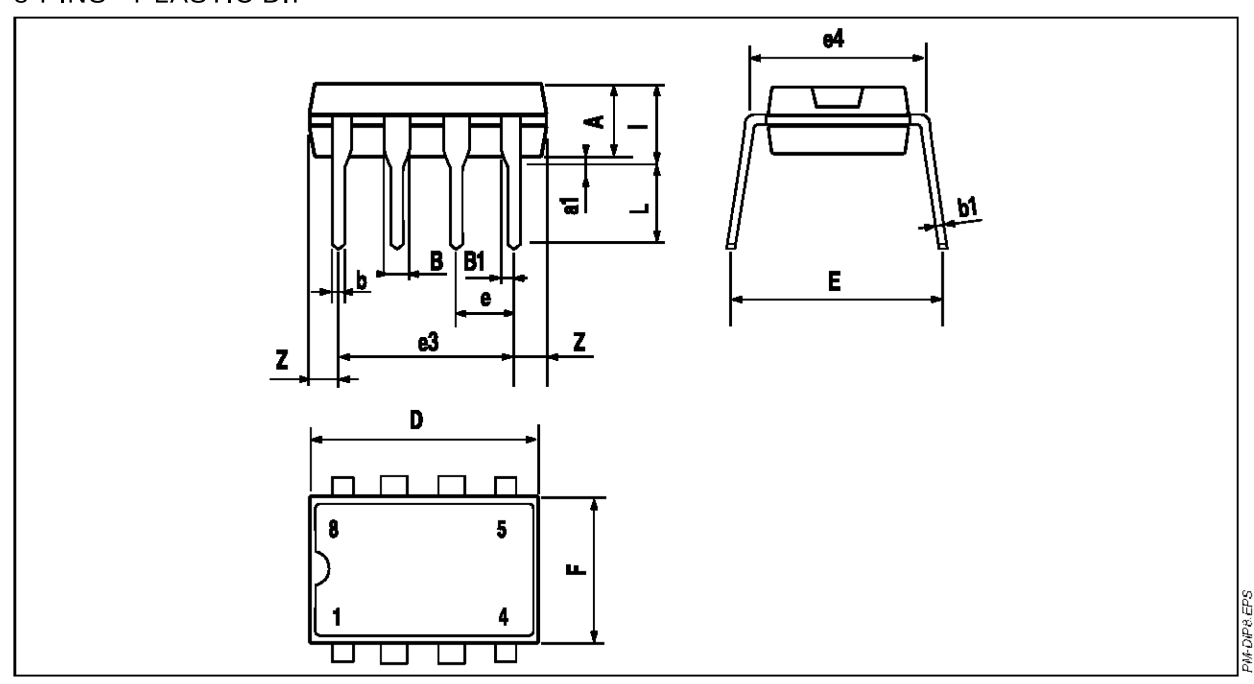


HIGH Q NOTCH FILTER



PACKAGE MECHANICAL DATA

8 PINS - PLASTIC DIP

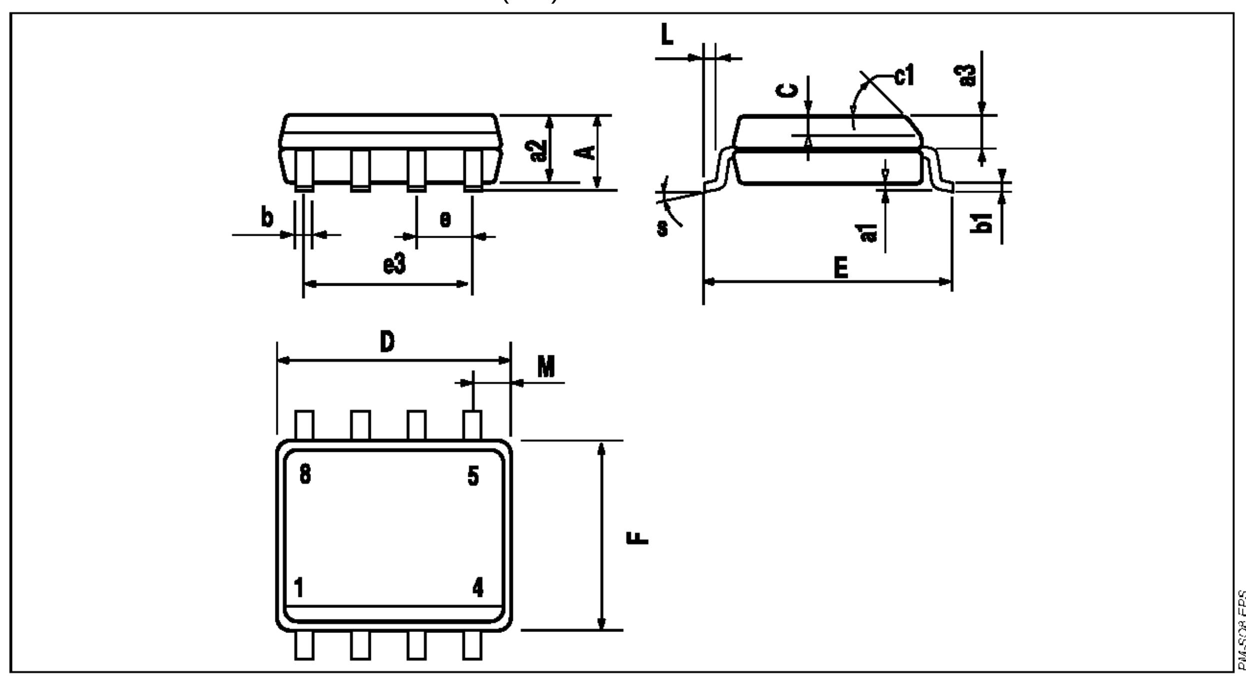


Dimensions	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A		3.32			0.131	
a1	0.51			0.020		
B	1.15		1.65	0.045		0.065
b	0.356		0.55	0.014		0.022
b1	0.204		0.304	0.008		0.012
D			10.92			0.430
E	7.95		9.75	0.313		0.384
e		2.54			0.100	
e3		7.62			0.300	
e4		7.62			0.300	
F			6.6			0260
i			5.08			0.200
L	3.18		3.81	0.125		0.150
Z			1.52			0.060

DIP8.TBL

PACKAGE MECHANICAL DATA

8 PINS - PLASTIC MICROPACKAGE (SO)



Dimensions	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			1.75			0.069
a1	0.1		0.25	0.004		0.010
a2			1.65			0.065
a3	0.65		0.85	0.026		0.033
b	0.35		0.48	0.014		0.019
b1	0.19		0.25	0.007		0.010
C	0.25		0.5	0.010		0.020
c1	45^{o} (typ.)					
D	4.8		5.0	0.189		0.197
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		3.81			0.150	
F	3.8		4.0	0.150		0.157
L	0.4		1.27	0.016		0.050
M			0.6			0.024
S	8^{o} (max.)					

0
7
1

ORDER CODE :

